Science and Technology Policies through Policy Dialogues

SCIENCE AND TECHNOLOGY POLICIES THROUGH POLICY DIALOGUE

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To formulate a science and technology (S&T) policy, one needs an adequate description and analysis of the research, technology and development situation in a country – a diagnostic study of S&T policies as well as the S&T landscape. This chapter discusses the development of a methodology and a toolbox for doing S&T diagnostic studies in developing countries.[2] The methodology is not intended to be used as a recipe, but rather as a set of guidelines and boundary conditions for carrying out such studies. An important reason for developing such a toolbox is to help generate S&T diagnostic studies that, because of their common methodological base, can contribute to the creation of a new cooperation strategy for science and technology that is shared by developing and donor countries.

1. Science, technology and society studies

Science, technology and society (STS) studies investigate the development of science and technology in their interaction with society.[3] One key result of these studies has been the re-valuation of indigenous knowledge. Scientific knowledge has been shown to be a specific knowledge system like many others. It does stand out for its specific characteristics, maintained through methodologies and checked by peer review, but these are social accomplishments, neither *a priori* given nor epistemologically different from 'other indigenous knowledge systems'.[4] Science has enormous value and potential, but this value is context-specific. There are situations in which scientific knowledge is irrelevant, and other types of knowledge more appropriate. This re-evaluation of indigenous knowledge and improved understanding of the process of scientific and technological work

are two cornerstones of an argument for a specific strategy to stimulate the use of research and technology for development.

Zooming in on the process of scientific and technological work, a similar point can be made: scientific research and technological development are heterogeneous activities that do not have the purity that some philosophies of science have assumed in the past. Scientific knowledge is constructed in laboratories, on the land of small farmers, in the offices of funding agencies, at international conferences, and in editorial offices. It is not a matter of asking clever questions of nature, who then shouts back a clear 'yes' or 'no'.[5] Thinking about research and science must go further than the illusion that a combination of methodology and laboratories will automatically produce new scientific knowledge.[6] S&T policies must take into account a broad variety of aspects of scientific research – funding, technical infrastructure, social institutions, training and teaching styles, publication possibilities, national culture, and international scientific relations. Probably the most important result of STS research is *the very possibility* of a policy dialogue on the contents of an S&T policy agenda – within the standard images of science and technology, there is no point in consulting anyone other than scientists and engineers about the S&T agenda.

With regard to technological development, sociological and historical studies have developed a constructivist analysis of technology in contrast to the standard image of technology that was largely 'technological determinist'. The resulting social shaping models stress that technology does not follow its own momentum or a rational goal-directed problem-solving path, but is instead shaped by social factors. Therefore, constructivist approaches to technology, such as the social construction of technology,[7] start by defining 'relevant social groups', including technology users and consumers. Technical artefacts are described through the eyes of the members of these relevant social groups. The interactions within and among these groups can give different meanings to the same artefact. As a result of the involvement of these different groups, problems are defined differently and so are possible solutions, giving rise to different interpretations as to whether a problem has been solved or to the proper working of a technology. This interpretative flexibility demonstrates the necessity for a sociology of technology – it shows that neither an artefact's 'success' or 'failure', nor its technical 'working' or 'non-working', are intrinsic properties but are subject to social variables. Therefore, technology is not constructed merely by engineers, but also by marketing departments, managers, anti-technology action groups and users. Indeed, advocates of indigenous knowledge have argued that small farmers continuously experiment and are often more successful in

improving agricultural techniques than are the large agricultural research institutions. It is therefore important to address issues in a wider cultural, political and economic milieu when formulating S&T policies.

It is important to stress that the employment of this sociologically informed constructivist image of science and technology in society does not discredit the work of members of other disciplines on S&T – such as that by economists, political scientists or policy analysts. It only puts the latter in a broadened and shifted perspective that allows us to identify the strengths but also the limitations of these bodies of work and thus provide a better explanation of how science and technology can be successful or unsuccessful in practice.

2. S&T in developing countries

In order to shed light on the questions why and with what consequences developing countries engage in scientific research and technological innovation, Shrum and Shenhav discuss three theoretical perspectives: modernization, dependency and institutional.[8]

The *modernization perspective* holds that science is strongly linked to technology, and thus improves the ability of a country to promote growth through the more efficient use of its resources. In order for a country to benefit, it is crucial that its economic infrastructure is able to absorb scientific research. Various studies have questioned this direct relationship between scientific research, technological innovation and economic growth. Particularly important for the argument in this chapter is to recognize that the modernization perspective erroneously assumes a linear relationship between science and technology. Rather, Shrum and Shenhav conclude, 'science penetrates the technological realm through a complex process consisting of several components but they do not occur in any determinate order. Often technological developments influence science'.[9]

The *dependency perspective* stresses that scientific research is another mechanism of domination of the developing countries by the industrialized countries, 'not just by producing the technological means for the subjugation of the masses (in some accounts) but also as an ideological force and an inappropriate developmental model. The creation and maintenance of scientific institutions not only absorb personnel and capital but constitute an irrelevant ideological diversion for countries without the resources or the connections to pursue Western, specialty-oriented science'.[10] Researchers in developing countries are often linked to international scientific communities

and the scientific core in industrialized countries, which often also set the research agenda. The issue of formulating a country's research agenda is crucial. In a longitudinal study of 73 countries, in which a distinction was made between indigenous and scientific knowledge, Shenhav and Kamens showed that for less developed countries there is no relationship between scientific knowledge and economic performance, and even a mildly negative correlation in the case of the poorest countries. Industrialized countries do show a positive correlation between economic performance and scientific knowledge.[11]

The *institutional perspective*, which complements the dependency perspective, highlights the isomorphism of scientific institutions in developing and industrialized countries, which produces a shared orientation in values and organizational forms. 'Through mimetic processes by which successful existing systems serve as models, scientific institutions and beliefs are prescribed and diffused as key elements of the modern world system'.[12] This explains why all countries, despite the questionable economic benefits noted above, are committed to promoting (Western) science. It is important to note the implied warning that by adopting Westernized science and organizational forms, the comparability and compatibility of developing countries' research will be promoted, but solutions to local problems not necessarily so.[13]

While these three perspectives pertain to both science and technology, most of the studies of S&T in developing countries focus on technology. Technology has more direct relevance for dependency and development issues because it includes the development and improvement of industrial processes, the transfer or invention of artefacts, the establishment of information, communication and transportation infrastructures, the improvement of crops and food production, and the shaping of social institutions. Here again the key theme is the presence or absence of ties within and among countries.

Many authors have discussed the problems and advantages of 'technology transfer' – the movement of artefacts and/or knowledge between countries. Relations between countries are almost always relations between organizations, either public or private. Most technology transfer activities take place within and via multinational companies. 'Received wisdom regarding the R&D activities of multinationals suggests a variety of negative effects, centring on the generation of dependence in recipients'.[14] In the case of the RTD project referred to above (see note 2), the focus was on enhancing the S&T capacity within developing countries in a sustainable way. Therefore, technology transfer is a less desirable method because it may impair the development

of domestic S&T capabilities that are appropriate to the country's stage and pace of socio-economic development.[15] State intervention and regulation are needed to support local firms in their relations with multinationals, and should be part of the country's science and technology policy.

However valuable the perspectives discussed in this section may be, for specific questions and situations, they all leave the content of science and technology untouched. They focus on the research system and institutions, rather than on the scientific knowledge and the technological artefacts and systems. The STS tradition introduced in the first section builds on an in-depth analysis of scientific and technological practices.

S&T policy

State action (including industrial, trade and S&T policy) is deemed crucial to the promotion of science and technology for development. Science and technology policy in socialist countries has received much attention; India, for example, has been studied in detail because of its relative openness and its active social scientific community. But studies of *how* science and technology policy is made in developing countries are still rare.[16] 'Increasingly it is recognized that state organizations compete with other institutions in less developed countries and that ... they are often too weak to implement unilateral change'.[17] In the 1970s R&D policies stressed the institutionalization of indigenous science and technology, while in the 1980s these 'self-reliant' policies were rethought and redefined.

Since the early 1980s, policy makers have realized that it does not make sense to conceive of development policy as a series of isolated projects. Often the positive effects of projects were nullified by poor macroeconomic policies or mismanaged institutions at the micro level. Hence, Szirmai notes, since the early 1980s foreign aid has increasingly been linked with a 'policy dialogue' aimed at improving macroeconomic policy and institutional reform, supported by the shift from project aid to programme aid. In this perspective, the dialogue element in programme aid focuses on establishing 'structural adjustment programmes aimed at macroeconomic stabilization and deregulation of the economy'.[18] Therefore, a broader conception of 'policy dialogue' should be adopted, one that is not restricted to this macroeconomic goal, but which also addresses the problem of the increased tension between national and local development and the possibly disruptive consequences of linking up with the high-speed environment of the global market.[19]

Policy dialogue

The concept of 'policy dialogue' was introduced into development policy discourse in the context of 'conditionality': setting conditions on foreign aid. These conditions referred primarily, though not exclusively, to economic policy. Respect for human rights, for example, might also be a condition, although Western policies have been very erratic in this respect. For the purposes of this chapter, it is more important to stress that both social policy and S&T policy can also be part of the policy dialogue. The arguments for this can be found in the previous sections.

Apart from bringing non-economic aspects to the table of a policy dialogue, the STS perspective has more radical implications that derive from its very different view of science and technology. The received view of policy dialogue builds on the necessary link between macroeconomic policy and development aid. We propose an extended conception of policy dialogue that, in addition, recognizes the socially constructed character of science and technology and therefore stresses the need to encompass a variety of other aspects as part of a successful research and technology for development policy. A policy dialogue as the basis for S&T policy should, for example, address the relations between 'Western' and indigenous knowledge; the conditions for endogenous development and reform of the country's institutional S&T infrastructure (rather than mimicking the institutional patterns developed in the industrialized countries); the conditions and formats for productive international cooperation via firms, universities, NGOs and government agencies; the various implicit conceptions of 'development' and 'beneficiaries'; the mechanisms that affect the distribution of benefits; the consequences of linking up with the global market and the ability to solve pressing local problems; and the country's educational and S&T capacities.

Finally, a further extension of the 'policy dialogue' concept is needed. The need to extend the subject matter to encompass a much wider variety of social, cultural, epistemological and political aspects has already been discussed. The dialogue should also be extended to other levels. Besides the dialogue between the donor countries and the developing nations, it is also necessary to stimulate a policy dialogue on a national level within the developing country, and on a regional level among developing countries. This is, again, supported by the previous analysis of science and technology. Science and technology do not develop in isolation, and hence a country's S&T policy needs to be fuelled by national discussions among stakeholders, policy makers, researchers, private companies and NGOs, as well as by inter-regional discussions among different developing countries.

3. A methodology for diagnostic studies of S&T in developing countries

To design an adequate strategy, one needs a good diagnosis of the situation. Similarly, to formulate an S&T policy, one needs an adequate description and analysis of the research, technology and development situation in a country – a diagnostic study. This comprises a diagnostic description of the S&T *policies* as well as the S&T *landscape*. If one wants to build an S&T policy *via a policy dialogue*, this sets specific additional criteria for such a study. This section identifies these criteria, and translates them into a methodology for carrying out such a diagnostic study.

The methodology is not presented in the form of rules to be followed simple-mindedly. Making a diagnostic study is a true scientific job to be carried out by experienced STS researchers with the necessary theoretical knowledge, empirical skills and tacit knowledge (see below). Instead, the methodology is cast in the form of a checklist that researchers can use to clarify the various dimensions and aspects they want to cover in their study. It also offers policy makers an instrument for discussing the plan for and results of a diagnostic study. All points on the checklist need not necessarily be covered by a particular diagnostic study, but the researcher should be able to argue why a specific point was omitted.

In the following paragraphs the insights from the previous sections are translated into clusters of checkpoints. The role of the checklist as part of a larger toolbox for generating diagnostic studies is discussed in section 4.

Concepts of policy and development

The argument for an S&T policy dialogue is founded on the recent rethinking of international aid and partnerships. It does not make much sense to conceive of development policy as a series of isolated projects; rather, it is necessary to link foreign aid with reform of macroeconomic policy and institutional infrastructure. The next step is to recognize that S&T policies need to address a wide set of issues. Technology policy cannot do without an economic reform policy, science policy cannot do without educational capacity building, and policies to reform the institutional infrastructure cannot do without an international collaboration policy. Such policies are destined to fail, and may even be damaging, if they do not properly fit with the socio-economic conditions and cultural particularities of the country concerned, and its desired direction and manageable pace of development. Such a broad scope is based on the observation that there are no neutral facts or technologies – all knowledge and all technologies are infused with politics

and are thus value-laden. This also applies to the concept of 'development'.

Proper goals for a nation's development cannot logically be derived from some *a priori* principles, but need to be established in and through a policy dialogue. Nor is the impact of research and technology on development straightforward: explicit discussion of the strategic effects of science and technology on development is necessary.

Policy and development: issues to be addressed	
1	• Is S&T policy linked to a wider set of issues? For example: • research institutional infrastructure; • research funding structure; • foreign aid structure, private and government; • intellectual property rights and patent regulation; • international research collaboration, both among universities and via NGOs and multinational companies.
2	• Is it recognized that all scientific knowledge and technological artefacts are value-laden? In other words, are specific technical and scientific accomplishments not used in naively neutral and objectifying terms?
3	• How is 'development' conceptualized by the various actors involved?
4	• How is the impact of science and technology on development viewed by the various actors involved?

The concept of 'policy dialogue'

The concepts of policy and development need to be complemented with the specific concept of policy dialogue, which has several elements.

First, we need to distinguish policy dialogue on three levels: *intra-national* (within the country and the government, involving national organizations and local stakeholders), *intra-regional* (among several developing countries in a region), and *international* (with donor countries). These three levels have implications for the types of actors and institutions that need to be included in a diagnostic study.

Second, to be a true *dialogue*, the policy dialogue must be interpreted as an ongoing, *open learning process*. *Open*, because policy goals and priorities are never fixed at the outset, but need to remain amenable to revision during the dialogue. *Learning*, because the policy dialogue should have the means to record the arguments, decisions, results, successes and failures of the process and make these widely available. And *process*, because the focus is on the process of reaching decisions on S&T policy rather than on the products of the dialogue. In other words, a policy dialogue is meant to

strengthen the cognitive and infrastructural base for S&T policies in developing countries, rather than merely to 'sell' donor countries' ideas. In addition to products such as reports detailing the new policy, the mutual learning and the development of a shared understanding of problems and of trust among participants, achieved in and through the process, are also important results of the dialogue. In this perspective experts or consultants are process facilitators rather than providers of content.

Qualitative indicators of the *open* nature of the process include the variety of actors involved, and the existence of procedures to guarantee that the views of end-users and of the private sector are taken into account. For adequate *learning*, indicators are the openness of accounting and reporting procedures and styles, the development of trust, recognition and appreciation among the participants of each other's specific competencies and their willingness to discuss, recognize and (re)consider the implicit assumptions and limitations of each position, argument or approach. Indicators of the *process* character are a tolerance of failure, regular evaluations of progress and adjustment of goals, the flexibility of procedures and the eagerness to discuss whether the procedures include or exclude relevant groups, or favour or suppress specific positions or arguments.

Third, a policy dialogue on S&T should at least focus on developing new national S&T policies, formulating strategies to support institutional reforms of S&T infrastructures, and strengthening national S&T capacities. In addition to these enormous tasks, the dialogue should concentrate on the intensification of scientific cooperation at national, regional and international levels, and the identification of innovative funding mechanisms to develop and sustain appropriate S&T infrastructures. Moreover, the policy dialogue should address other issues such as ensuring a proper fit between S&T policies and the country's socio-economic conditions and cultural context, identifying the conditions and formats of collaboration that will help to meet national and local development needs, and to strengthen domestic S&T capabilities in the long term. Finally, the policy dialogue should explore strategies to address the consequences of linking the country to global markets, in particular to ensure a balance between the rapid pace of change in these markets (fuelled by the industrialized countries) and the pace of change that local and rural communities can tolerate without being disrupted.

Fourth, the S&T policy dialogue should allow for the participation of a large variety of relevant actors and groups. The dialogue should of course engage S&T communities such as universities and research institutes, and the public authorities responsible for formulating and implementing national

S&T policies and for reforming and strengthening public and private S&T infrastructures and capabilities. However, the intended end users of technologies, donor agencies, NGOs, private sector companies and local stakeholders from civil society (who may not be organized or represented at the national level) should also be involved in formulating the research and innovation goals at the earliest possible stage in order to ensure the best possible fit between innovation and implementation.

Policy dialogue: issues to be addressed	
5	Are different levels of policy dialogue distinguished? • intra-national • intra-regional • inter-national
6	Is the policy dialogue an open process? For example, by identifying: • a wide variety of actors and institutions involved • the procedures giving 'outsiders' access to the policy dialogue • the influence of end-users • the influence of the private sector
7	Is the policy dialogue conceived as a learning process? For example, by identifying: • procedures for accounting and checking the dialogue • procedures for reporting the results of the policy dialogue • positive strategic reactions to failures • flexibility in maintaining procedures and devising new ones • a reflexive attitude with regard to both the content and process of the dialogue • transparency of the policy dialogue process
8	Is the policy dialogue addressing key issues? At least: • the development of new S&T policies • reform of S&T institutions • strengthening of national S&T capacities • intensifying international S&T collaboration • innovation of funding structures • conditions for productive collaboration • fit with socio-economic and cultural context • pace of change in the global market and that of local communities
9	Are all relevant social groups, institutions and actors involved? At least: • user groups, potential users, local and national stakeholders • public authorities • donor agencies • S&T communities and institutions • NGOs • private sector companies

Description of the S&T landscape

A policy dialogue that is geared towards developing an S&T policy requires an adequate assessment of the current S&T landscape – the universities, private and public research institutions, funding agencies, NGOs and relevant regulatory agencies and other government offices. Such an assessment should focus on describing and analyzing indicators such as the numbers of scientists and technologists, the budgets at their disposal and their scientific and innovative activities.

The S&T landscape: issues to be addressed	
10	Is the S&T landscape described in terms of institutions: • universities • private and public research institutions • funding agencies • NGOs • relevant regulatory agencies and other government offices And in terms of relevant indicators: • science and technology workforce • financial budgets • scientific and innovative activities

Analysis of power relations

The parties involved in a policy dialogue are not neutral, without interests or agendas of their own. Therefore, in order to understand the dynamics of the policy dialogue and of S&T development in a country, the power relations between the various institutions need to be adequately described. Relevant aspects include economic, ethnic and political hierarchies, and national laws and international agreements relating to (intellectual) property rights, including patents.

Analysis of power relations: issues to be addressed	
11	Have the hierarchical relations between the various research institutions, donors, ministries, NGOs and multinational companies been adequately mapped?
12	Have national regulations that set conditions for R&D within multinational firms and national private businesses been described?
13	Have national laws and international agreements relating to (intellectual) property rights, including patents, been described?

Concepts of science and technology

After setting the general stage for policy making and policy dialogue, it is time to turn to the specific subject of S&T. It is important to avoid naive images of S&T, since they tend to deny the social, cultural, political and historical dimensions, and thus the possibility of an S&T policy that also aims to influence the research and innovation agenda substantially. To avoid these inadequate and ineffective images, it is necessary to take into account the results of the past two decades of STS research. In practice, this implies that all relevant social groups, not just engineers and scientists, need to be mapped. In doing so, special attention should be paid to the variety of cultural, regional and national sources of knowledge and technology (e.g. indigenous knowledge and traditional techniques).

Science and technology: issues to be addressed	
14	Have all the relevant social groups involved in a specific scientific or technological development been described?
15	Have all relevant forms of indigenous knowledge, craft knowledge and local expertise been described?

Fields of science and technology

A broad view of what constitutes new developments in S&T is crucial in order to exploit the potential of a country's scientific and technological capacity. Therefore, a policy dialogue should not only cover those areas most likely to contribute to the country's ability to link up with global markets, but should also explore areas such as biotechnology, ICTs, agricultural and marine technologies, and fields that are more likely to address local level development needs. Recent shifts in focus between fields of science and technology need to be highlighted in order to give an historical perspective to the science policy dynamics of a country. If a country already has an explicit policy on research and technology for development, it should be fully described.

Fields of S&T: issues to be addressed	
16	Have all relevant fields of science and technology been covered, including those that enhance the country's ability to link up with global markets, as well as those that aim to meet local needs? Has, for example, the trap been avoided of identifying technological progress with computers only?

17	Have the changes in focus between fields of science and technology over the past decade been documented?
18	Have the country's S&T policy plans been described?

Implementation of S&T policies

S&T policies need to explicate a strategy for demonstration and dissemination of research and innovation. In both the public domain and in private business, it is often assumed that once a new scientific finding is communicated or a new technical innovation is demonstrated, all the rest will follow automatically. Nothing could be further from the truth. Research findings and technological innovations need to be marketed and implemented. Marketing is not a straightforward process of launching the new fact or artefact into the wider world – continuous management, translation and coaching are also required. Hence, an S&T diagnostic study needs to pay explicit attention to such issues as demonstration, adoption-adaptation, implementation and diffusion. Here, it is important not to deny the existence of failures, since they may offer more interesting lessons than the successes.

Implementation of S&T policies: issues to be addressed	
19	Is the dissemination of scientific findings and implementation of technological innovations given sufficient attention? This may involve, for example, separate funding or management structures.

4. Generating diagnostic studies

The various checklist clusters presented above can be packaged in a toolbox for generating diagnostic studies that can be used in the formulation of policies to promote science and technology for development. Tools in a toolbox, however, can never stand alone, and even the best tools do not guarantee good work. Tools will only work if they are used by skilled people; they need to be accompanied by manuals, and to be handled with unwritten tacit knowledge. Also, they should be used by people with the relevant contextual knowledge and skills for doing social studies of science and technology in developing countries. This toolbox does not provide those basic knowledge and skills, although it does provide some means for acquiring and employing them. Even more crucial is *when* to pick up the toolbox in the first place. A necessary condition for applying the checklist is, of course, that the central role of S&T for development is recognized. It is equally important to recognize that such policy formulation should be done on the basis of a

policy dialogue.

A diagnostic studies 'toolbox' should contain the following items: the checklist for designing and evaluating diagnostic studies, a workshop for training researchers, and advice to the relevant government agency to prepare the policy-making infrastructure. These items can best be described by following the process of promoting S&T for development. The first step in that process is to translate the overall political vision of the responsible agency into a concrete strategy. That means describing the policy problem in the right terms, and ensuring that the relevant politicians and policy makers agree on an adequate definition. Unless the general issue is framed in the right technocratic and bureaucratic terms, it will not survive. Once the political and administrative conditions are set, the diagnostic studies can be carried out. But to do that, researchers have to be trained to use the methodology. This can best be done in small, intensive workshops.

S&T diagnostic studies are the key element in the strategy to shape and stimulate S&T for development, and must be carried out by experienced and well prepared senior researchers, preferably with some experience in studying science and technology in society. They may have varied disciplinary backgrounds, such as the social sciences with some affinity to natural sciences and technology, or vice versa.

It is not enough, however, simply to hand these researchers the methodology. No methodology can be read as a recipe, but should be mastered in practice – learned 'on the job'. To save time, this learning can most effectively be done in a workshop where researchers who have already carried out diagnostic studies can share their experiences with new researchers.

Although the primary purpose of such a workshop should be to train the researchers who are to carry out the S&T diagnostic studies, it may be attractive and effective to use them for an additional goal as well. One of the recurrent themes in this chapter has been that science and technology should not be viewed as isolated activities in society. Rather, they should be viewed as part of the complex network that constitutes civil society – end users, funding bodies, small local companies, multinational corporations, policy makers, etc. Including some of these people in the workshop may serve several purposes. First, the policy makers and private business people will get to understand some of the basic concepts underlying the new strategy to promote S&T, and thus will be better prepared for what will be asked of them in the next steps. Second, the researchers will be confronted with some of the standard problems and objections they will encounter when talking to these various groups in society. Thus the workshop becomes a kind of 'learning laboratory' in which the researchers are trained almost as if they

were really 'on the job', but efficiently concentrated in time and space.

The final step is to carry out the diagnostic study. The researchers contracted to do this have been trained in the workshop. To guarantee the process character of the diagnostic study, it is important to have in place an infrastructure of national and international contacts to support the researchers. At the national level, it may be wise to set up a kind of advisory committee that can help the researchers to reflect upon their findings. Such a committee could also be used to create, at an early stage, a base of support among politicians and government agencies, the research community and civil society. At the international level, a network of researchers who are involved in similar projects could enable them contribute to the modification and improvement of the methodology for carrying out S&T diagnostic studies.

Diagnostic studies will hopefully provide the kind of comprehensive inventory of relevant information and views that should form the basic ingredients of a policy dialogue on S&T policies. All relevant actors should be able to give inputs to, and make use of the outputs from, these diagnostic studies. The diagnostic study itself will be an instrument to help identify relevant actors, groups, and organizations to be included in this dialogue process. If conceived and carried out in this way, diagnostic studies will contribute to a democratization of the use of science and technology in developing societies.

Acknowledgements

The author wishes to acknowledge Dr Chris Leonards and Dr Ger Wackers for their inputs, and Rutger Engelhard for his valuable suggestions for the final version of this paper.

Notes

1. Wiebe E. Bijker (w.bijker@tss.unimaas.nl) is Professor of Technology and Society, University of Maastricht, the Netherlands.
2. The methodology was developed as part of an endeavour to stimulate a Research and Technology for Development (RTD) policy dialogue between the European Commission, the EU Member States and the African, Caribbean and Pacific (ACP) countries. The aim of the project (2000–2002) was to develop a framework for policy dialogue that would enable ACP countries to address the challenges and issues related to reforming their national RTD policies and strengthening their capabilities.
3. For an overview of STS studies, see Jasanoff *et al.* (1995).
4. See *Watson-Verran and Turnbull* (1995).
5. See *Latour and Woolgar* (1987), Collins (1985).

6. Even in such esoteric fields as high-energy physics, scientific knowledge has been shown to be influenced by the cultural, social and economic circumstances under which it is produced (Traweek, 1998).
7. See Bijker (1995) for an account of this social construction of technology approach. For a summary, see Bijker (2001).
8. Shrum and Shenhav (1995: 627–651).
9. *Ibid.*, p.630.
10. *Ibid.*.
11. Shenhav and Kamens (1991).
12. Shrum and Shenhav (1995).
13. See Turnbull (1989) for a study of agenda setting around the development of a malaria vaccine in an Australian-Papua New Guinea collaboration.
14. Shrum and Shenhav (1995: 637).
15. This is not to say that technology transfer can never play a positive role under specific circumstances. See Shrum and Shenhav (1995).
16. See Wieberdink (2004).
17. Shrum and Shenhav (1995: 639).
18. Szirmai (1997).
19. With a focus on Asia, a similar argument is made by Pinkney (1993: 5–17).

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